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## (54) Moisture resistant frozen food packaging using an over-print varnish

(57) This invention relates to moisture resistant packaging, usable notably for frozen-food, using highly-sized paperboard and press applied moisture resistant over-print varnishes. Such structures of this type, generally, employ a moisture-resistant coating which is placed between the food product and the paperboard in order to provide a barrier for the food from the board and also to prevent the paperboard from absorbing moisture. Also, edge-wick moisture absorption is minimised by the use of a highly-sized sheet.

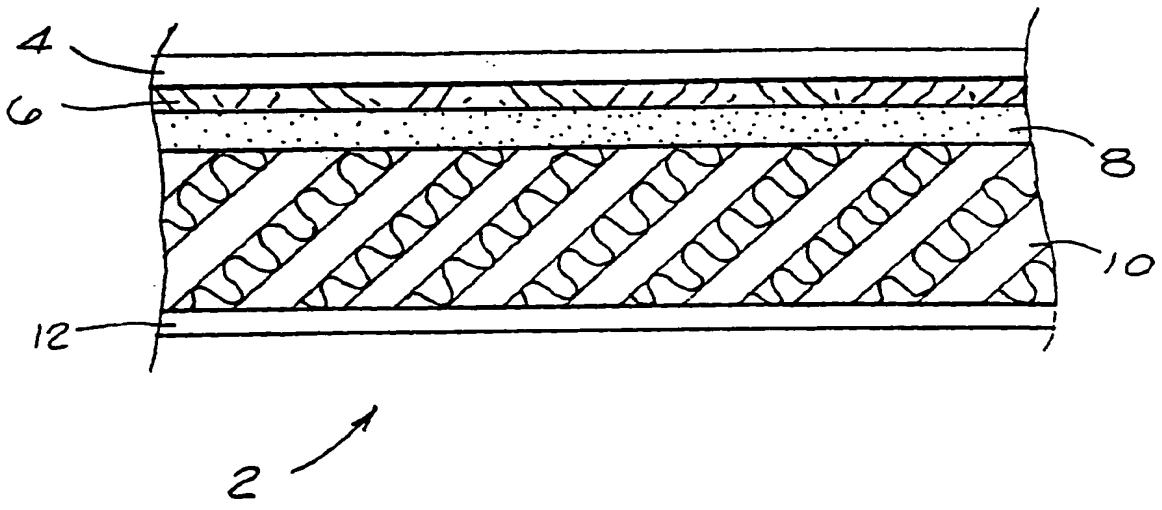


FIG. 1

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solid bleached sulphate (SBS) sheet. Definitively, the term paperboard describes paper within the thickness range of 0.020 to 0.071 cm (0.008 to 0.028 in.). The invention is relative to the full scale of such a range as applied to packaging and beyond. Substrate 10, preferably, is sized according to conventional techniques and at a sizing application rate, by weight, of the addition of approximately 0.8% of rosin size or 0.4% alkyl ketene dimer size. Food contact polymer layer 12 can include any suitable food contact polymer such as, but not limited to, polyethylene terephthalate, polypropylene, polyethylene, and nylon. Finally, layer 12, preferably, is applied at a rate of approximately 8.62 kg per 92.9 $m^2$ (19 pounds per 1,000 $ft^2$).

With respect to FIGURE 2, there is illustrated another embodiment of a composite structure 20. Structure 20 includes, in part, water-resistant varnish layer 4, a second hold-out varnish layer 22, print graphics layer 6, particulate mineral layer 8, paperboard substrate layer 10, and food contact polymer layer 12. Layers 4, 6, 8, 10 and 12, preferably, are constructed of the same materials as their corresponding layers in composite structure 2.

However, composite structure 20 includes an additional hold-out varnish layer 22 located between water-resistant varnish layer 4 and print layer 6. Layer 22, preferably, is constructed of any suitable overprint varnish. Also, layer 22 is applied at a coat weight of approximately 0.45 kg per 92.9 $m^2$ (1 pound per 1,000 $ft^2$). It has been determined that by applying layer 22 prior to the application of layer 4, a significant improvement in water resistance can be obtained. The improvement is shown in the Table, below.

Composite structures 2 and 20 are preferable to most printers/converters since they involve printing on a clay coated surface rather than on a polymer surface. As discussed above, printing on polymers involves special inks, equipment and requires extra drying time to pass through. It also often involves extra warehouse space to allow pallets of printed substrate to dry prior to converting or additional printing. Without additional warehousing to allow drying, printing on polymers often excludes the use of two passes through the printing press which reduces the type of presses that can be used and the number of colours that can be applied to a package. Printing on a clay-coated surface, then applying the water-resistant varnish or a water resistant varnish and a hold-out varnish, according to the present invention, allows the printer to pursue various options in printing graphics. This is because the press application of the varnishes eliminates an extra converting step that is currently necessary with many packages.

Laboratory trials using water-resistant varnishes on ovenable paperboard (clay-coated solid bleached sulphate (SBS) with a polyethylene terephthalate coating) and liquid packaging paperboard with polyethylene were conducted. The results, in the Table below, demonstrate how the water-resistant varnish and the use of a highly-sized paperboard have superior water-resistance as compared to standard ovenable paperboard.

TABLE

| Sample | % water pick-up* |
|---|---|
| PET-coated paperboard (control) | 51% |
| PET-coated liquid packaging paperboard (control) | 52% |
| PET-paperboard with varnish | 28% |
| PET-liquid packaging paperboard with varnish | 13%** |
| Polymer-coated both side paperboard | >5% |

* % water pick up is defined as the weight of water absorbed by the paperboard after 1 hour of submersion divided by the initial weight of the paperboard. 15% is the limit established by a typical customer/converter.

** 13% is an average value taken from values ranging from 7% to 25%. The 25% data point is believed to be due to inadequate coat weight resulting in a discontinuous film layer.

As can be seen from the data in the TABLE, the use of water resistant varnish with various types of paperboard decreases the percentage of water pick-up i. e., increase the water-resistance. Even though the water pick-up of the varnished aseptic paperboard is not as low as the polymer-both-side paperboard, the converting and printing advantages of the present invention make it more desirable for the customer and the ultimate end user. As discussed above, this is due to the cost, ease of manufacturing and superior graphics when printing on a clay surface as compared to polymer-on-wax surface.

Once given the above disclosure, many other features, modifications or improvements will become apparent to the skilled artisan. Such features, modifications or improvements are, therefore, considered to be a part of this invention, the scope of which is to be determined by the following claims.

## Claims

1. A composite structure usable notably for paperboard packaging, in particular for frozen-food, having decreased edge-wicking and including an over-print varnish for increasing moisture resistance, characterised in that it com-

prises:

- a water resistant, over-print varnish layer;
- a print graphics layer located interior to the varnish layer;
- a layer of particulate minerals located interior to the print graphics layer;
- a paperboard substrate located interior to the layer of particulate minerals; and
- a food-contact polymer layer located interior to the paperboard substrate.

2. The structure according to claim 1, characterised in that said varnish layer comprises:

- an acrylic-based varnish.

3. The structure according to claim 1 or 2, characterised in that said particulate mineral layer comprises a substance selected from the group consisting of: clay, and calcium carbonate.

4. The structure according to any one of claims 1 to 3, characterised in that said paperboard substrate comprises a highly-sized paperboard.

5. The structure according to claim 4, characterised in that said highly-sized paperboard comprises a rosin acid sizing material.

6. The structure according to any one of claims 1 to 5, characterised in that said polymeric layer comprises a compound selected from the group consisting of: polyethylene terephthalate, polypropylene, polyethylene, and Nylon.

7. The structure according to any one of claims 1 to 6, characterised in that said structure comprises a hold-out varnish layer located substantially between said over-print varnish layer and said print graphics layer.

8. The structure according to claim 7, characterised in that said hold-out layer comprises an over-print varnish suitable to cover inks or graphics.

9. A method for constructing the composite structure according to claim 1, characterised in that it comprises the steps of:

- sizing a paperboard substrate having first and second sides to decrease edge-wicking;
- coating said first side of said substrate with a layer of a food contact polymer;
- coating said second side of said substrate with a layer of particulate materials;
- coating said layer of said particulate minerals with a layer of print graphics; and
- coating said graphic layers with a layer of an over-print varnish to increase moisture resistance.

10. The method according to claim 9, characterised in that said coating steps are further comprised of the step of:

- press-applying said food-contact polymer, said particulate minerals, said graphics and said over-print varnish with a printing press.

11. The method according to claim 9 or 10, characterised in that said sizing step comprises the step of sizing said substrate at a rate, by weight, of the addition of approximately 0.8% rosin acid or 0.4% alkyl ketene dimer to the sizing.

12. The method according to any one of claims 9 to 11, characterised in that said food-contact polymer layer is coated at a coat weight of approximately 8.62 kg per 92.9 $m^2$ (19 pounds per 1,000 $ft^2$).

13. The method according to any one of claims 9 to 12, characterised in that said over-paint varnish layer is applied at a coat rate of at least 0.45 kg per 92.9 $m^2$ (1 pound per 1,000 $ft^2$).

14. The method according to any one of claims 9 to 13, characterised in that said method is further comprised of the step of placing a layer of a hold-out varnish substantially between said print graphics layer and said over-print varnish layer.

15. The method according to any one of claims 9 to 14, characterised in that said hold-out varnish layer is applied at a coat weight of approximately 0.45 kg per 92.9 $m^2$ (1 pound per 1,000 $ft^2$).

16. The method according to any one of claims 9 to 15, characterised in that said hold-out layer is press-applied with a printing press.

17. The use of a composite structure according to any one of claims 1 to 8 for packaging, in particular frozen-food packaging.

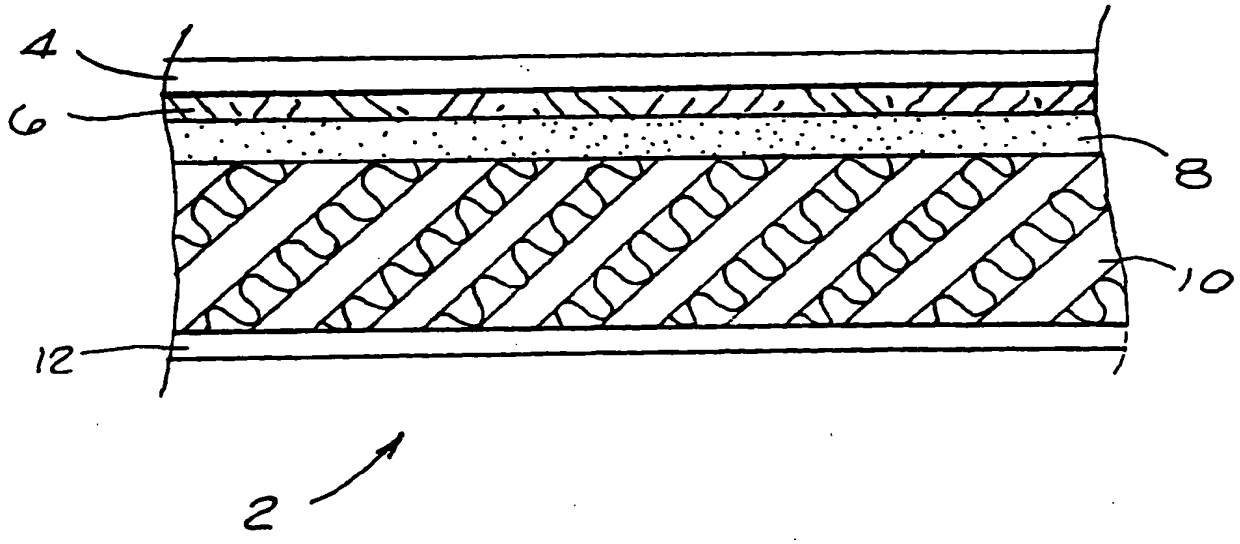


FIG. 1

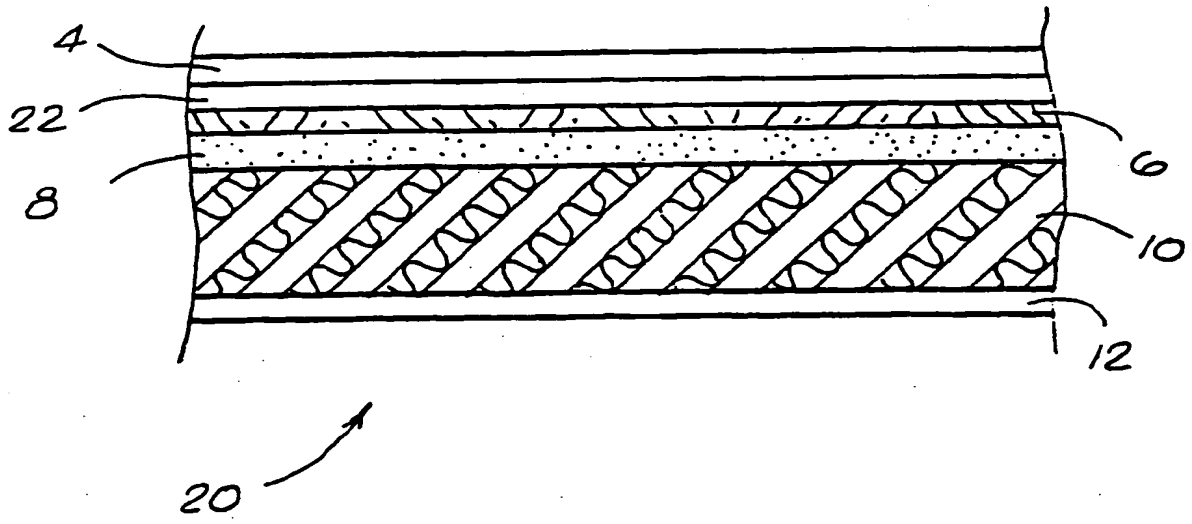


FIG. 2

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# EUROPEAN SEARCH REPORT

Application Number
EP 97 40 1247

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
|---|---|---|---|
| A,D | US 4 595 611 A (J.R.QUICK ET AL.)<br>* column 1, line 49 - column 3, line 25 *<br>* claims 1-30 *<br>--- | 1-17 | B41M7/00<br>B32B21/12<br>B65D65/40<br>D21H27/10 |
| A | EP 0 583 727 A (PKL VERPACKUNGSSYSTEME GMBH)<br>* column 2, line 6 - line 38 *<br>* column 3, line 16 - column 4, line 6 *<br>* claims 1-19; figures 1-4 *<br>--- | 1-17 | D21H19/84 |
| A,D | US 4 830 902 A (T.M.PLANTENGA ET AL.)<br>* column 1, line 5 - line 12 *<br>* column 1, line 63 - line 68 *<br>* column 2, line 43 - column 3, line 6 *<br>* claims 1-6; examples 1-3 *<br>--- | 1-17 | |
| A | FR 2 500 019 A (J.VENTHENAT AND M.VENTHENAT)<br>* page 3, line 7 - page 4, line 29 *<br>* claims 1-8; figure 1 *<br>----- | 1-17 | |

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41M
B32B
B65D
B05D
D21H

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 28 August 1997 | Bacon, A |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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